Title: **"Improved Miscible Nitrogen Flood Performance Utilizing Advanced Reservoir Characterization and Horizontal Laterals in a Class I Reservoir – East Binger (Marchand) Unit"**

Type of Report: **Quarterly Technical Progress (Report No. 15121R14)**

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Disclaimer

Abstract

Implementation of the work program of Budget Period 2 of the East Binger Unit ("EBU") DOE Project is progressing and nearing completion. EBU 63-2H has been drilled, completed, and brought on line. This is the second of three horizontal wells planned for this Budget Period, but based on the costs and performances to date of all new wells, could be the last. It will take some time to evaluate their impact on sweep and ultimate recovery.

In addition to the drilling of new wells, the project also includes conversions of five wells from producers to injectors. Three wells were previously converted, and a fourth, EBU 37-3H, was prepared for conversion at the end of this reporting period. The fifth will require an expensive workover and will be re-evaluated.

Project response to the various projects continues to be very favorable. Gas injection into the pilot area has increased from 4.0 MMscf/d prior to development to an average 7.3 MMscf/d in this reporting period, while gas production has actually decreased from 4.1 MMscf/d to 3.9 MMscf/d. The nitrogen content of produced gas has dropped from 58% to 52%. This has reduced the nitrogen recycle within the pilot area from 60% to 27%. Meanwhile, pilot area oil production has increased, from 300 bpd prior to development to over 600 bpd in September 2003. The pilot area oil rate will fall off as EBU 63-2H, which began producing new formation oil on September 6, declines to a stable rate.

TABLE OF CONTENTS

LIST OF GRAPHICAL MATERIALS

Quarterly Technical Progress Report – 3rd Quarter 2003

Introduction

Implementation of the work program of Budget Period 2 of the East Binger Unit ("EBU") DOE Project continues. The major activity completed during the period was the drilling and completion of the second horizontal well in this Budget Period, EBU 63-2H.

This quarterly report covers the Third Quarter of 2003. In addition to the second horizontal well coming on production, well EBU 37-3H was prepared for conversion to injection service. This is the fourth of five conversions planned for the project, and will be the first horizontal injection well in the field. EBU 37-3H was drilled in Budget Period 1.

Monitoring of the project continues with the gathering and analysis of gas samples.

Executive Summary

Implementation of the work program of Budget Period 2 of the East Binger Unit ("EBU") DOE Project is progressing and nearing completion. EBU 63-2H has been drilled, completed, and brought on line. This is the second of three horizontal wells planned for this Budget Period, but based on the costs and performances to date of all new wells, could be the last. It will take some time to evaluate their impact on sweep and ultimate recovery.

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Experimental

There were no experimental methods used in the work completed during this reporting period.

Results and Discussion

The following is a detailed review of the work conducted in this reporting period.

Task 1.2.1 – Drill New Horizontal Producing Wells

Figure 1 shows the well work planned for implementation in Budget Period 2. The second planned horizontal well, EBU 63-2H, has been completed and brought on production. The first Budget Period 2 horizontal well, EBU 64-3H, was drilled and completed in 2002 and is also on production.

A third horizontal producing well was originally part of the Budget Period 2 Project Plan, but will likely be replaced by another project. As discussed below under Task 1.2.5 (Project Monitoring), performances to date of all new wells lead Binger Operations to believe that the additional recovery of horizontal wells does not justify their additional cost and risk – although long term benefits cannot yet be fully evaluated.

Task 1.2.3 – Convert Producers to Injection

The fourth of five planned conversions, EBU 37-3H, occurred just after the end of the period, in early October. As previously reported, EBU 57-1, EBU 65-1, and EBU 59-1 were converted in June 2002, January 2003, and May 2003, respectively.

The fifth planned conversion, EBU 61-1, is still planned for late 2003 or early 2004. However, this will require a fairly expensive workover and will be re-evaluated.

Task 1.2.4 – Construct, Modify, and Upgrade Plant Capacities

The installation of the additional injection compression was completed in May. Field injection has increased approximately 1 MMscf/d. There is plant capacity to increase another 1 to 2 MMscf/d, but injection is being limited at this time due to the high cost of electricity.

Task 1.2.5 – Initiate Monitoring of Pilot Area Performance

Overall, pilot area performance continues to show significant improvement with the development drilling and producer-to-injector conversions. At the end of the reporting period, well EBU 63-2H had been on production for about one month, during which it added about 250 bopd to the pilot area and the field. This increased the average pilot area production rate in September 2003 to 605 bopd, a net increase of 305 bopd. Production from new wells added about 375 bopd but was offset by the loss of 70 bopd from wells converted to injection. See Figures 2 (all wells in pilot area), 3 (pre-existing wells), and 4 (new wells).

As shown in Figure 2, gas cycling has also been impacted favorably. Total nitrogen produced from the pilot area has declined from 2.4 MMscf/d (4.1 MMscf/d total gas with a nitrogen content of 58%) to 2.0 MMscf/d (3.9 MMscf/d total gas with a nitrogen content of 52%). Over the same

time period, total nitrogen injection has increased from 4.0 MMscf/d to 7.3 MMscf/d. As shown in the table below, this represents a total change in gas recycle from 60% prior to development to 27% now. These figures will be further enhanced with the conversion of EBU 37-3H to injection, but ultimate benefits will take some time to quantify as the production and injection rates stabilize and the flood progresses.

Pilot Area Gas Recycle

	[A] Total Gas Production Rate (MMscf/d)	[B] Percent Nitrogen (%)	[C] = [A]*[B] Nitrogen Production Rate (MMscf/d)	[D] Nitrogen Injection Rate (MMscf/d)	[C] / [D] Percent Recycle (%)
Pre-Development Baseline (1H 2001)	4.1	58	2.4	4.0	60
Current (3Q 2003)	3.9	52	2.0	7.3	27

[Note – The "Pre-Development Baseline" numbers differ slightly from those reported in the previous Quarterly Technical Progress Report – 15121R13 for 2Q 2003 – due to the use of a different time basis.]

Another aspect of Pilot Area Performance Monitoring is evaluating the economic benefit of drilling horizontal wells compared to drilling vertical wells. The long term sweep benefits of the horizontal wells cannot be estimated at this time, but early rate performance suggests that there is not enough additional recovery from the horizontal wells to justify the additional cost and risk. Figures 4 (first 100 days) and 5 (first 13 months) provide comparisons of the rate performances of the new wells drilled in Budget Period 2. The three wells shown were all drilled in the same area of the field, as shown in Figure 1, and have low GORs and gas nitrogen contents.

Vertical well EBU 74G-2 cost just over $700,000 to drill and complete, while horizontal wells EBU 63-2H and EBU 64-3H cost about $1,900,000 and $2,500,000, respectively. A sidetrack was required during the drilling of EBU 64-3H, adding $500,000 to $600,000 to the cost. If this had not been required, EBU 64-3H also would have cost around $1,900,000. Still, one must recognize and acknowledge that drilling horizontal wells adds risk over drilling vertical wells.

There are many possibilities for why there is not more of a difference in rate performance between the horizontal wells and the vertical well, including completion (stimulation) practices, reservoir quality, and reservoir pressure. Unfortunately, diagnosing production problems and understanding production performance is also much more difficult and expensive in horizontal wells than in vertical wells. The rate performances of these wells will be continually monitored throughout the project. Eventually, as more performance data is gathered, their impact on ultimate recovery can be estimated to complete the horizontal versus vertical comparison.

Gas sampling also continues in the pilot area. Data collected is presented in Figure 6. The largest increases in nitrogen content have been seen at EBU 57-2 and EBU 58-2, in response to the

conversions of EBU 57-1 and EBU 59-1 to injection. See Figure 1. Other normal increases have been offset by the low nitrogen content gas from the new wells. This monitoring effort will also continue throughout the project.

Task 1.2.6 – Technology Transfer Activities

Additional technical progress reports have been posted on the project web site, www.eastbingerunit.com. Binger Operations, LLC, personnel have had discussions with other companies who have visited the web site and inquired about the project.

Conclusion

Implementation of the pilot project of the East Binger Unit DOE Project is nearing completion. The third of the four planned new wells, EBU 63-2H, was drilled and completed during the reporting period and is currently on production. The fourth of five planned producer-to-injector conversions was ready to be performed at the end of the reporting period.

Monitoring of overall performance of the pilot area continues. Project response to the various projects continues to be very favorable. Gas injection into the pilot area has been increased over 80%, from 4.0 MMscf/d to 7.3 MMscf/d, while gas production has actually decreased from 4.1 MMscf/d to 3.9 MMscf/d, with the nitrogen content of produced gas dropping from 58% to 52%. This has reduced the nitrogen recycle within the pilot area from 60% to 27%.

It remains to be seen whether horizontal wells provide a benefit over vertical wells. Early production rate performance suggests they do not provide sufficient additional production to justify their incremental cost and risk, but it will take some time to evaluate their impact on sweep and ultimate recovery. Based on costs and performance to date, the third planned horizontal well will likely be replaced by another project.

References

There are no references for this report.

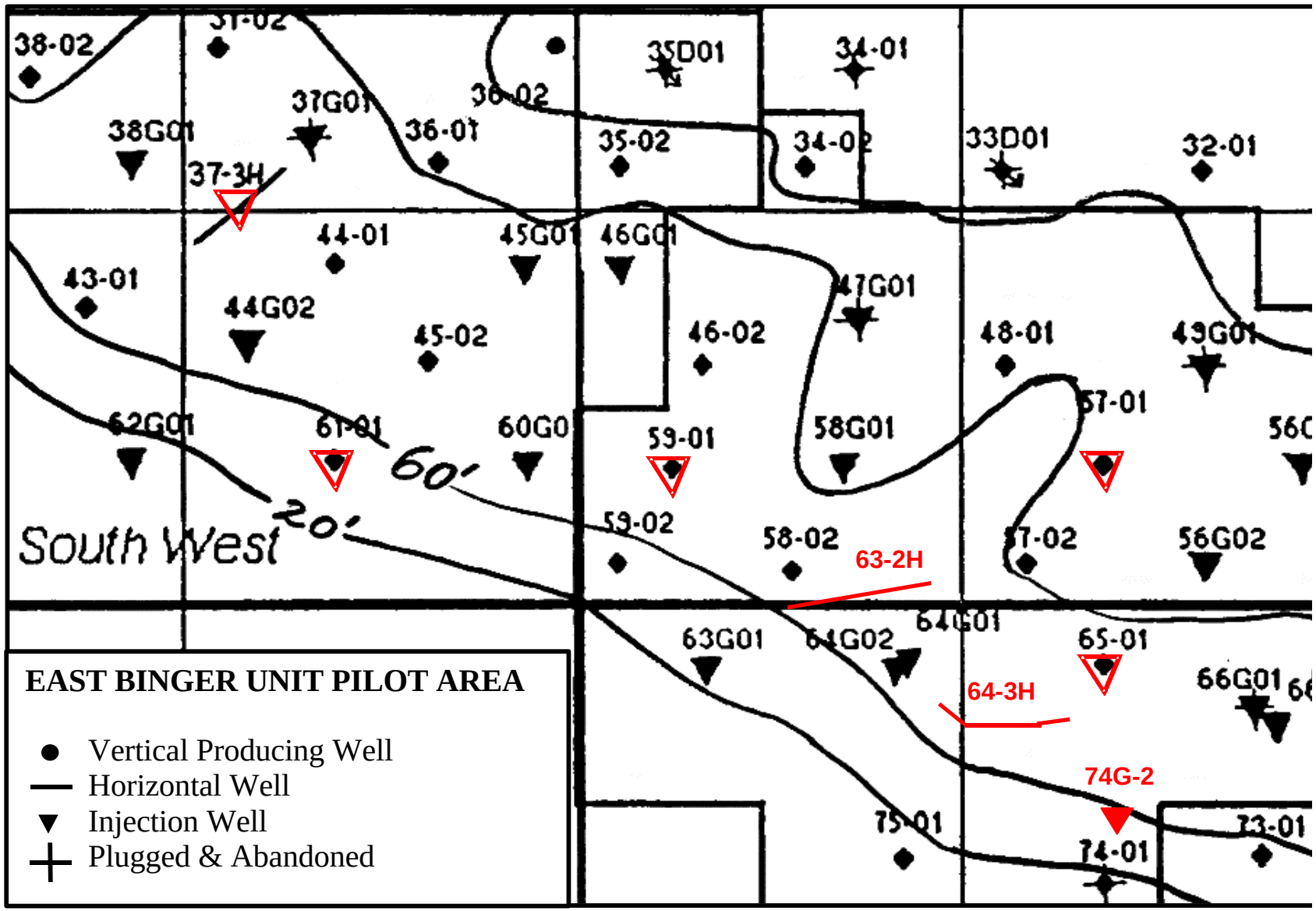

Figure 1. Wellwork planned for the pilot - shown in red.

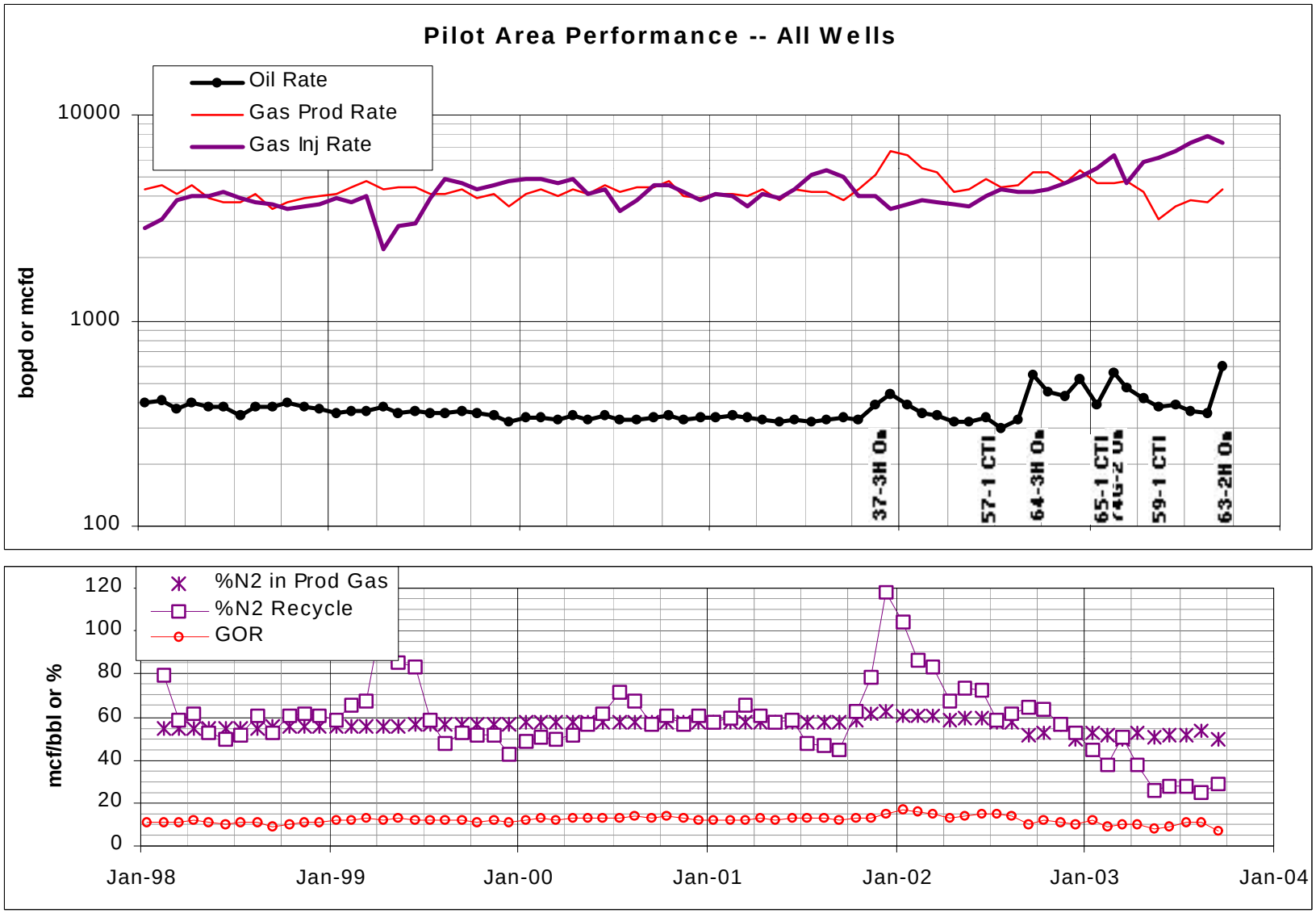

Figure 2. Production data for all wells in the pilot area.

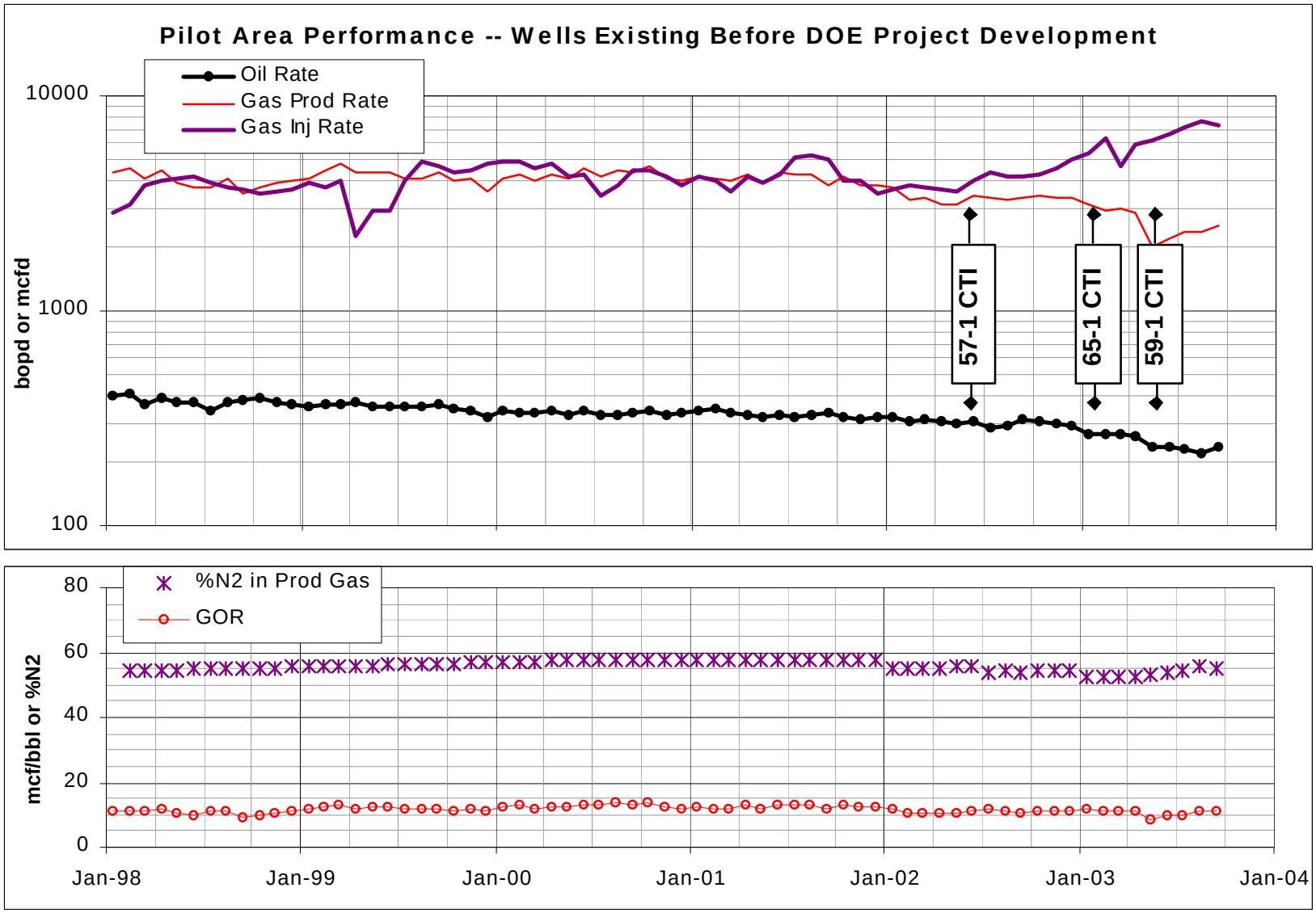

Figure 3. Production data for wells in the pilot area that existed before DOE Project development.

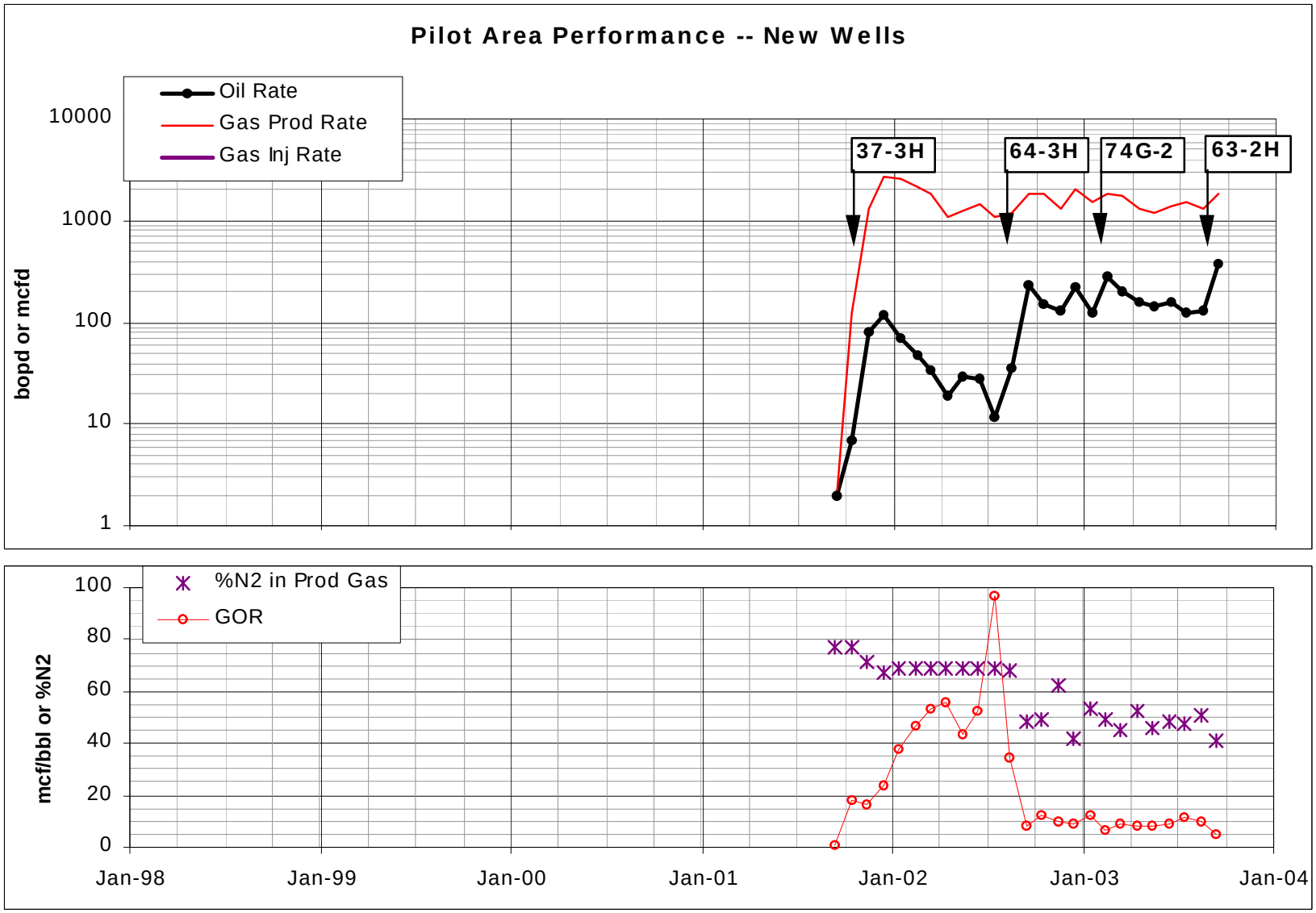

Figure 4. Production data for new wells in the pilot area.

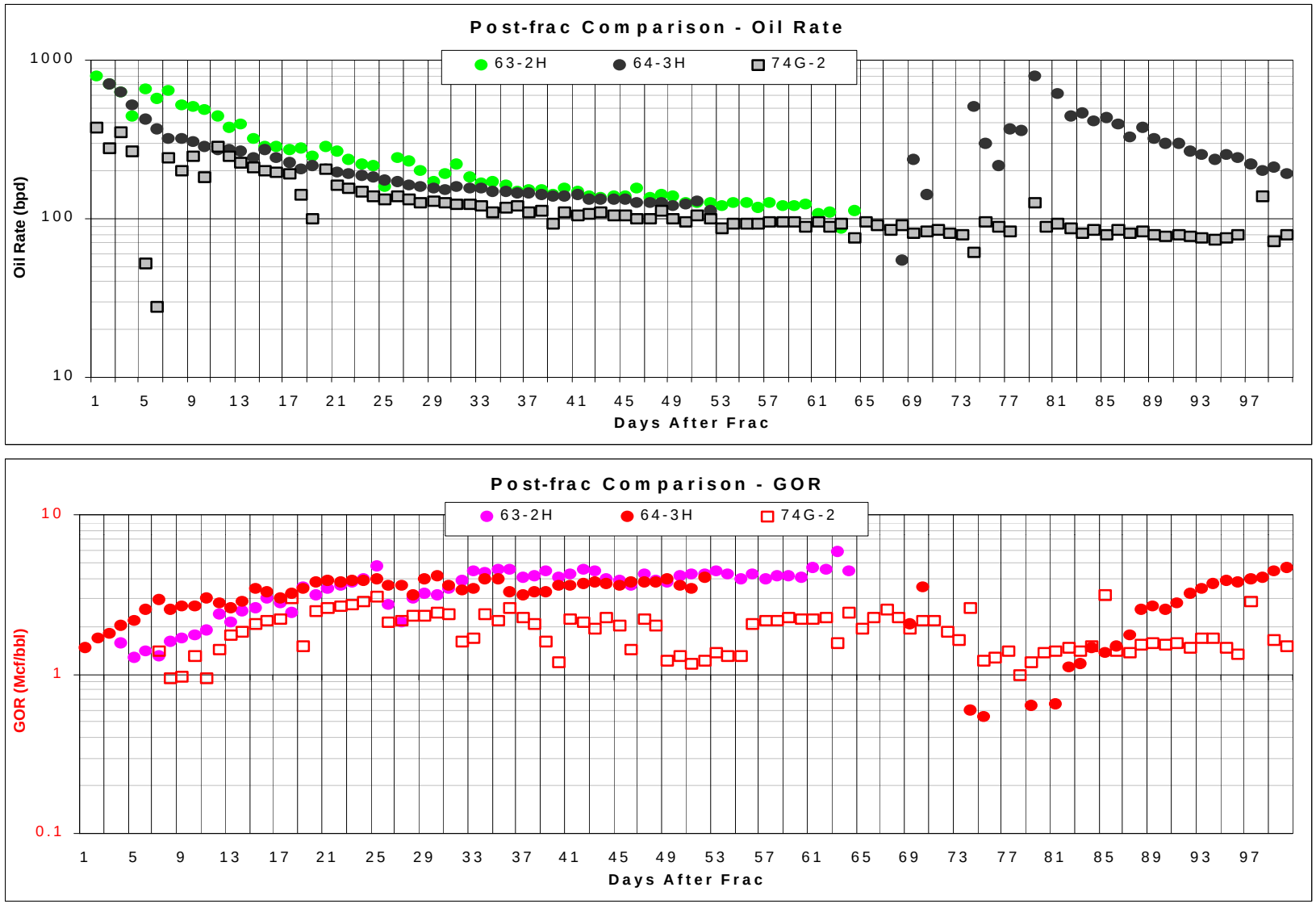

Figure 5. Comparison of production data for horizontal and vertical wells drilled in Budget Period 2 – the first 100 days.

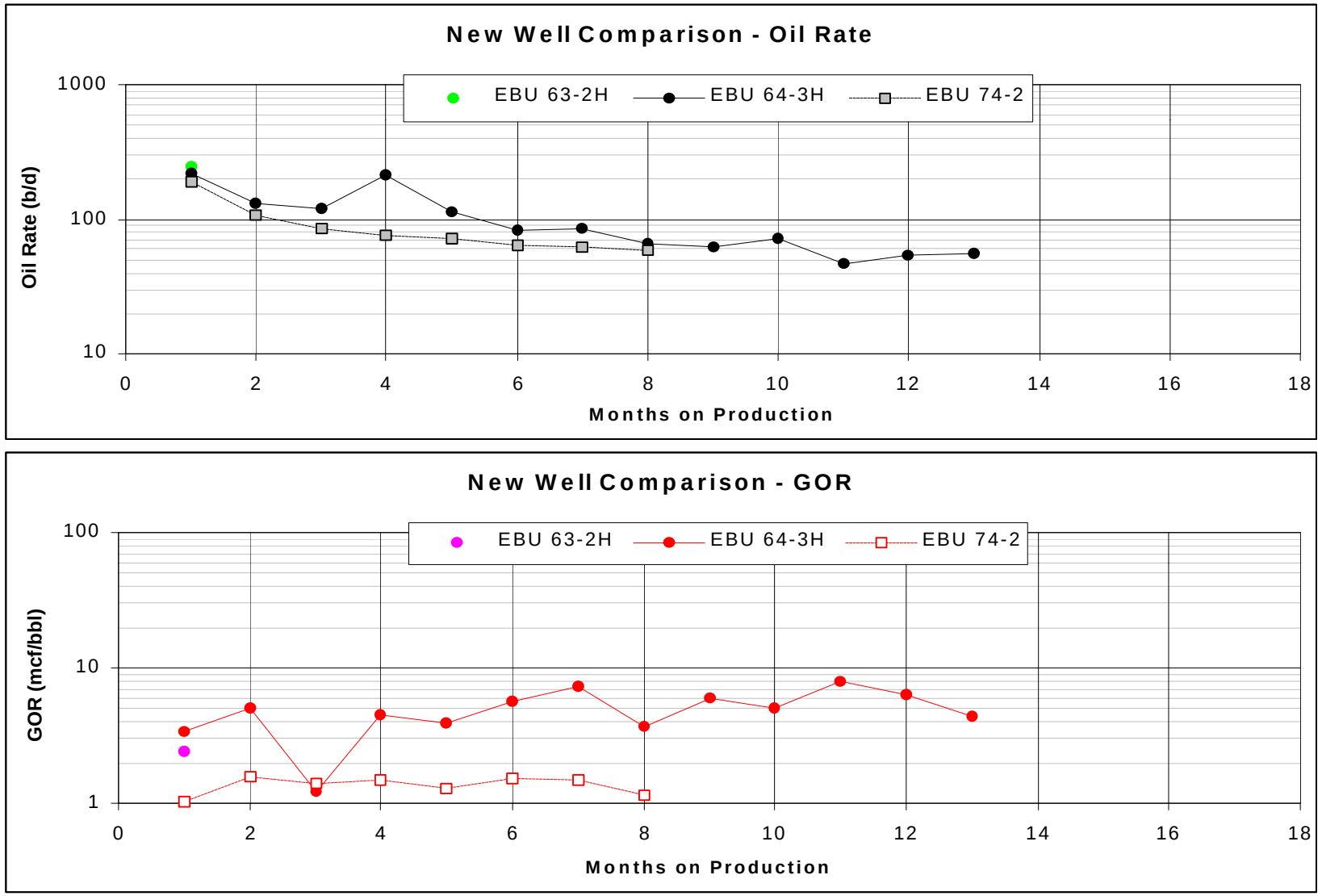

Figure 6. Comparison of production data for horizontal and vertical wells drilled in Budget Period 2 – the first 13 months.

East Binger Unit Pilot Area
Nitrogen Content in Produced Gas
3rd Quarter 2003 Sample Data

Well	December 2001 Sample	3rd Qtr 2002 Sample	4th Qtr 2002 Sample	1st Qtr 2003 Sample	2nd Qtr 2003 Sample	**3rd Qtr 2003 Sample**
35-2	58%	-	61%	-	63%	**67%**
36-1	65%	50%	49%	46%	47%	**44%**
36-2	25%	-	29%	-	20%	**-**
37-2	83%	77%	79%	80%	79%	**80%**
37-3H	68%	69%	67%	69%	-	**62%**
43-1	9%	10%	-	7%	-	**6%**
44-1	69%	67%	67%	68%	71%	**66%**
45-2	56%	58%	-	57%	59%	**60%**
46-2	62%	-	-	68%	64%	**61%**
48-1	83%	83%	84%	84%	85%	**86%**
57-2	37%	41%	39%	41%	45%	**47%**
58-2	8%	5%	-	6%	5%	**29%**
59-2	44%	-	-	48%	45%	**43%**
61-1	56%	-	-	-	56%	-
63-2H	-	-	-	-	-	**16%**
64-3H	-	23%	18%	17%	16%	**23%**
73-1	13%	21%	-	21%	-	**21%**
74G-2	-	-	-	6% - 10%	10%	**10%**

Figure 7. Pilot Area gas sample data.